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Song et al.

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(54) **BATTERY PACK RETENTION SYSTEMS FOR MOBILE COMPUTING DEVICES**

(71) Applicant: **ZEBRA TECHNOLOGIES CORPORATION**, Lincolnshire, IL (US)

(72) Inventors: **Zichun Song**, Cedar Park, TX (US); **David William Reber**, Cedar Park, TX (US); **Mark Thomas Fountain**, Hitchin (GB); **Lawrence Allen Stone**, Austin, TX (US)

(73) Assignee: **Zebra Technologies Corporation**, Lincolnshire, IL (US)

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(51) **Int. Cl.**

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H01M 50/264	(2021.01)
H05K 5/00	(2025.01)
H05K 7/00	(2006.01)
H01M 50/247	(2021.01)

(52) **U.S. Cl.**

CPC ***G06F 1/1635*** (2013.01); ***G06F 1/1679*** (2013.01); ***H01M 50/264*** (2021.01); *H01M 50/247* (2021.01); *H01M 2220/30* (2013.01)

(58) **Field of Classification Search**

CPC H01M 50/264; H01M 50/247; H01M 50/262; H01M 50/20; G06F 1/1635; G06F 1/1679; G06F 1/1633; G06F 1/1675

See application file for complete search history.

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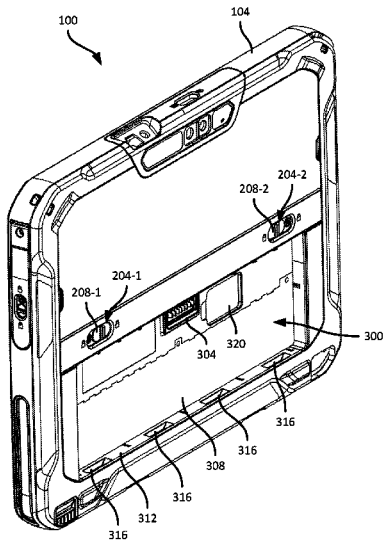
Primary Examiner — Anthony M Haughton

(57) **ABSTRACT**

A computing device includes: a housing defining a battery chamber; an electrical contact disposed on a wall of the battery chamber; a latch extending into the battery chamber, the latch movable between (i) a first position to retain a battery pack within the battery chamber and engage the battery pack with the electrical contact, and (ii) a second position to disengage from the battery pack; an auxiliary retainer in communication with the battery chamber, the auxiliary retainer configured to retain the battery pack within the battery chamber, independently of the latch, via engagement with a complementary retaining structure of the battery pack.

18 Claims, 12 Drawing Sheets



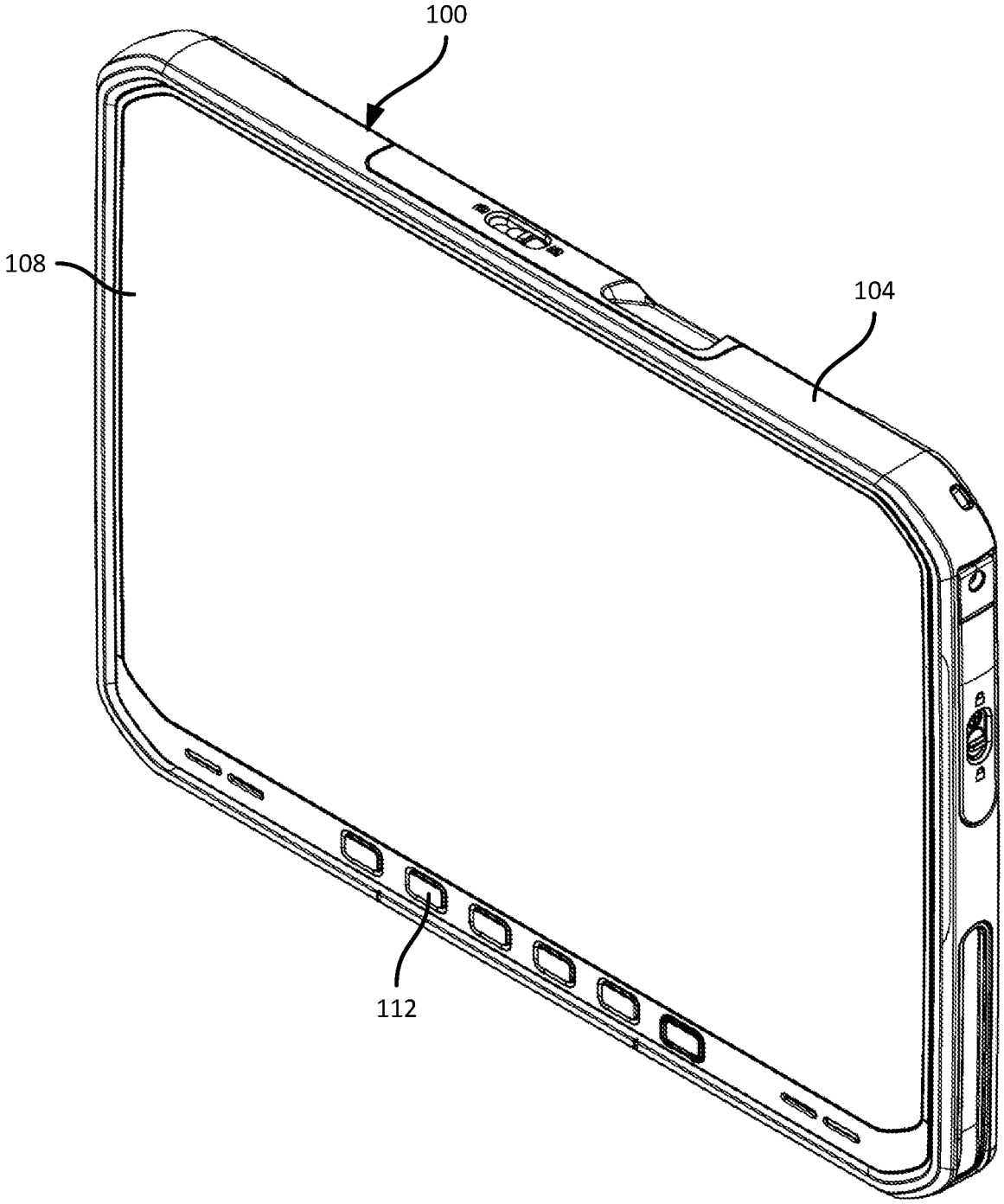


FIG. 1

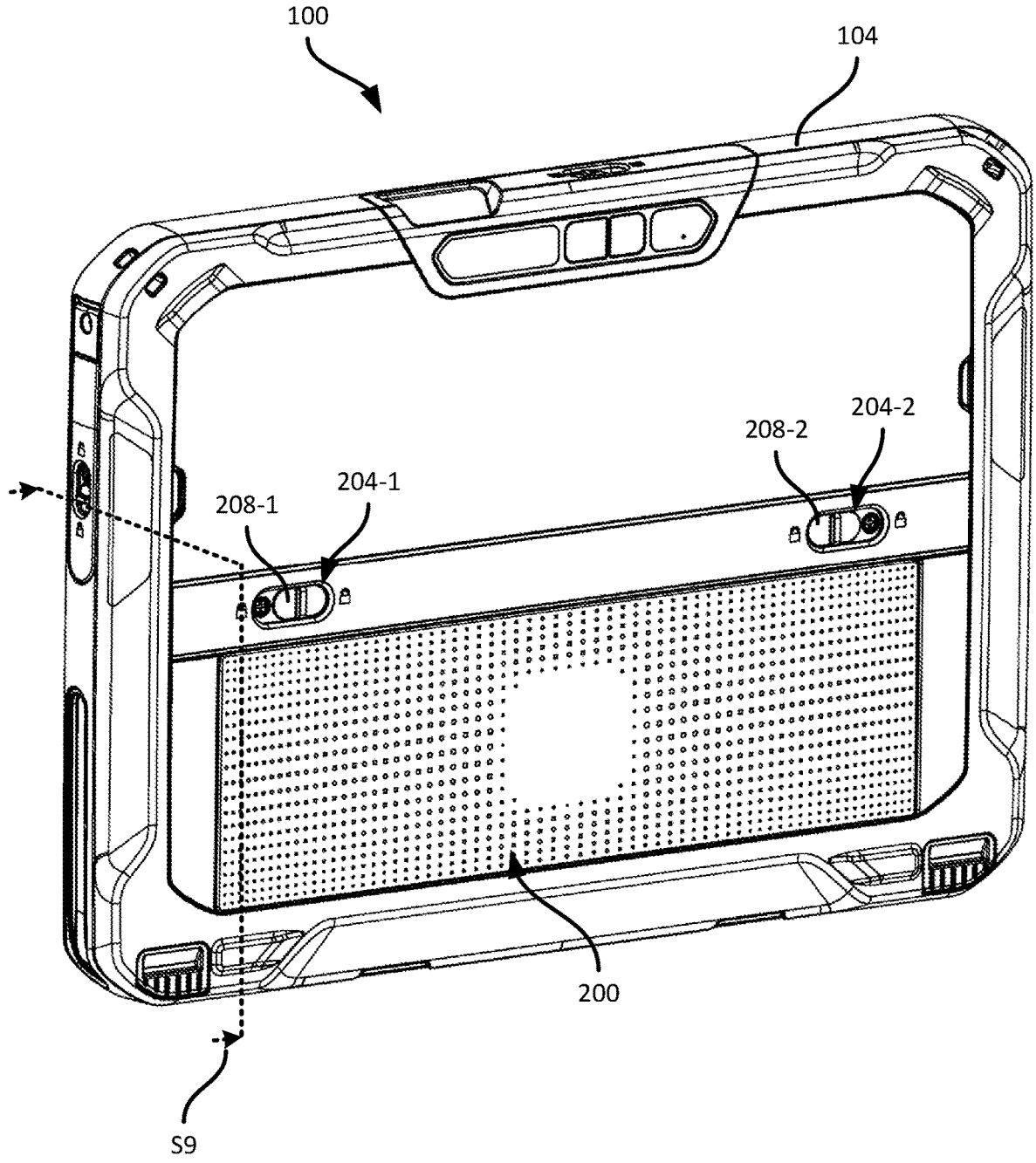


FIG. 2

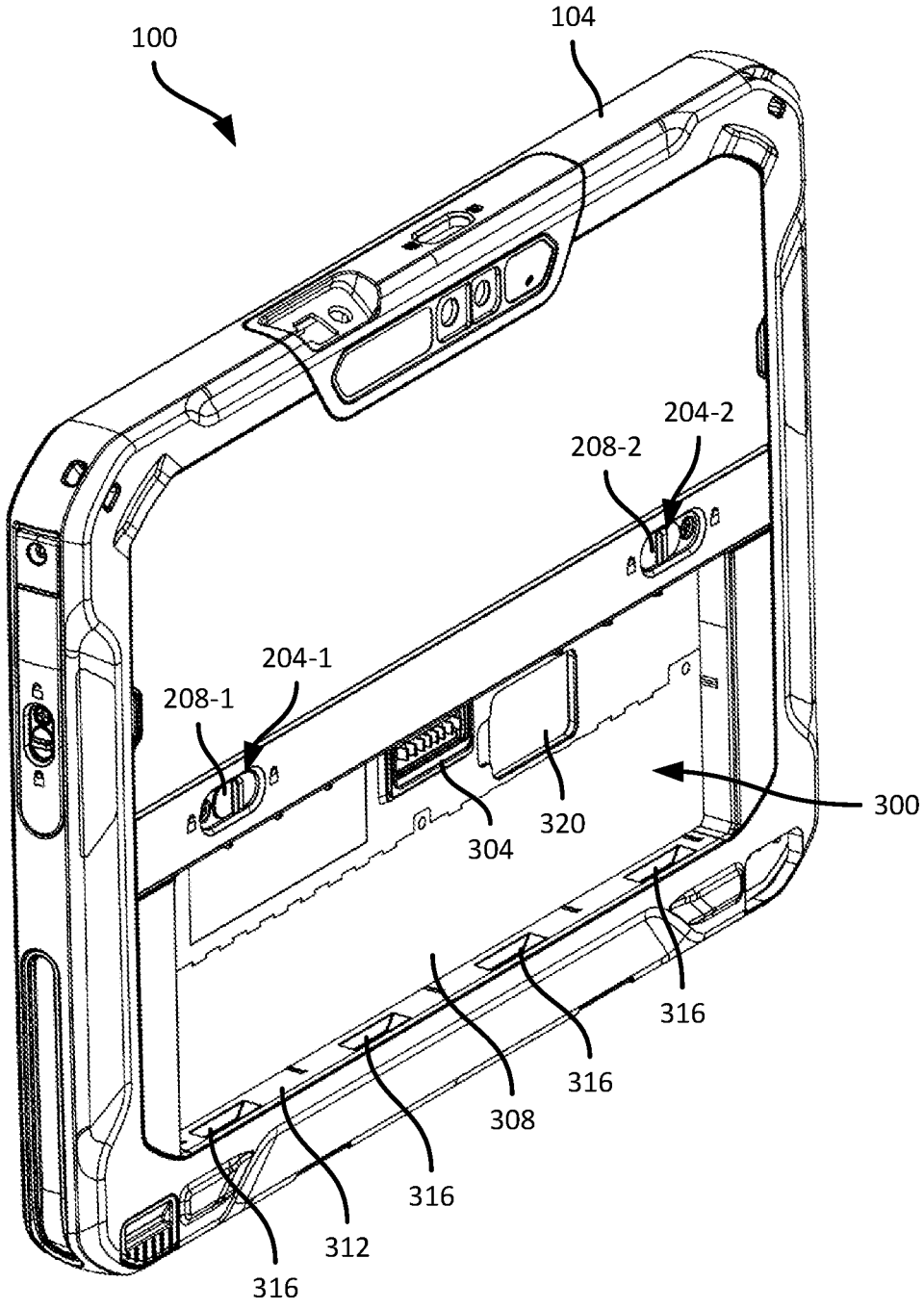
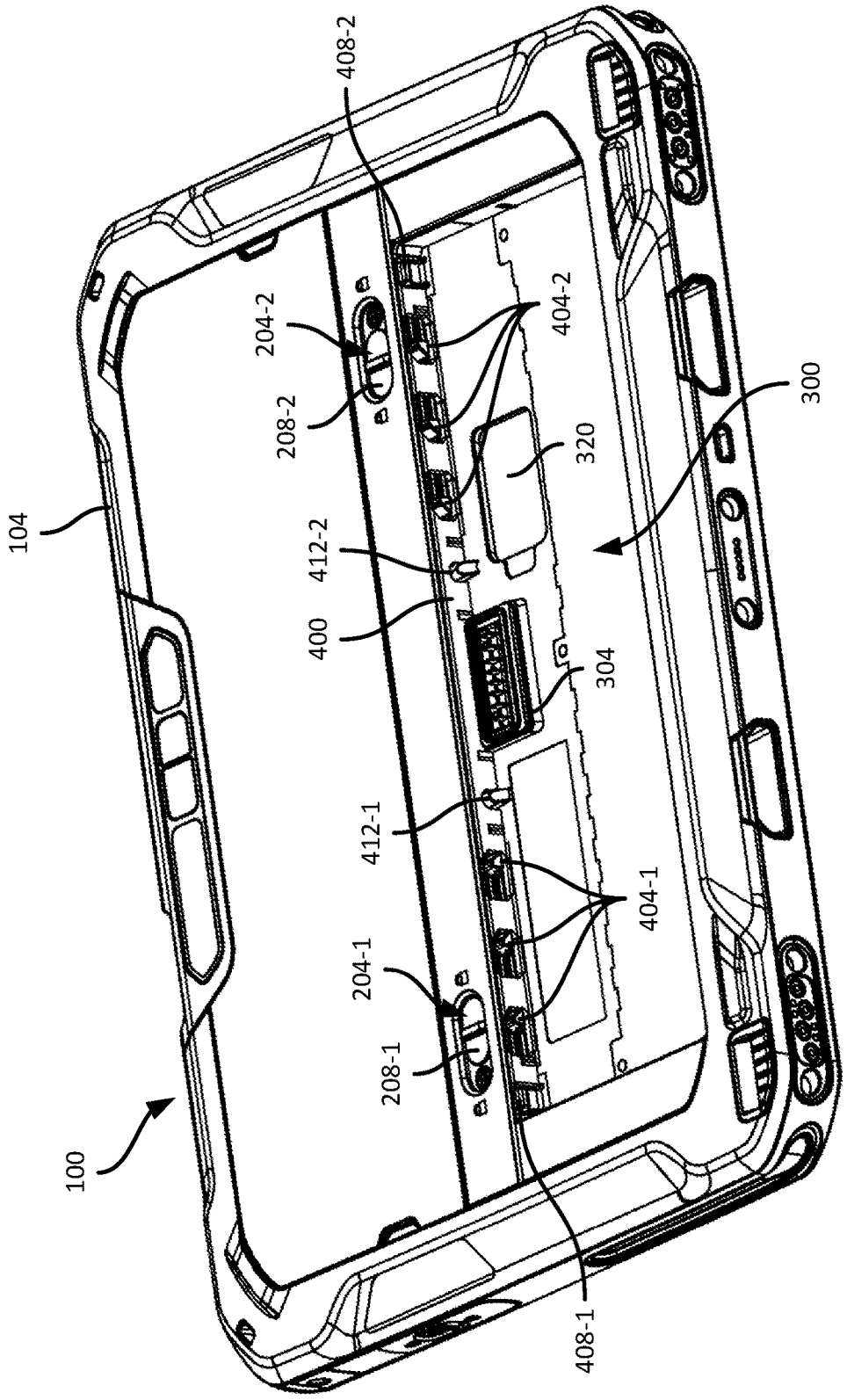


FIG. 3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204-2
404-2
208-2
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412-2
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404-1
204-1
208-1
100
408-1

FIG. 4

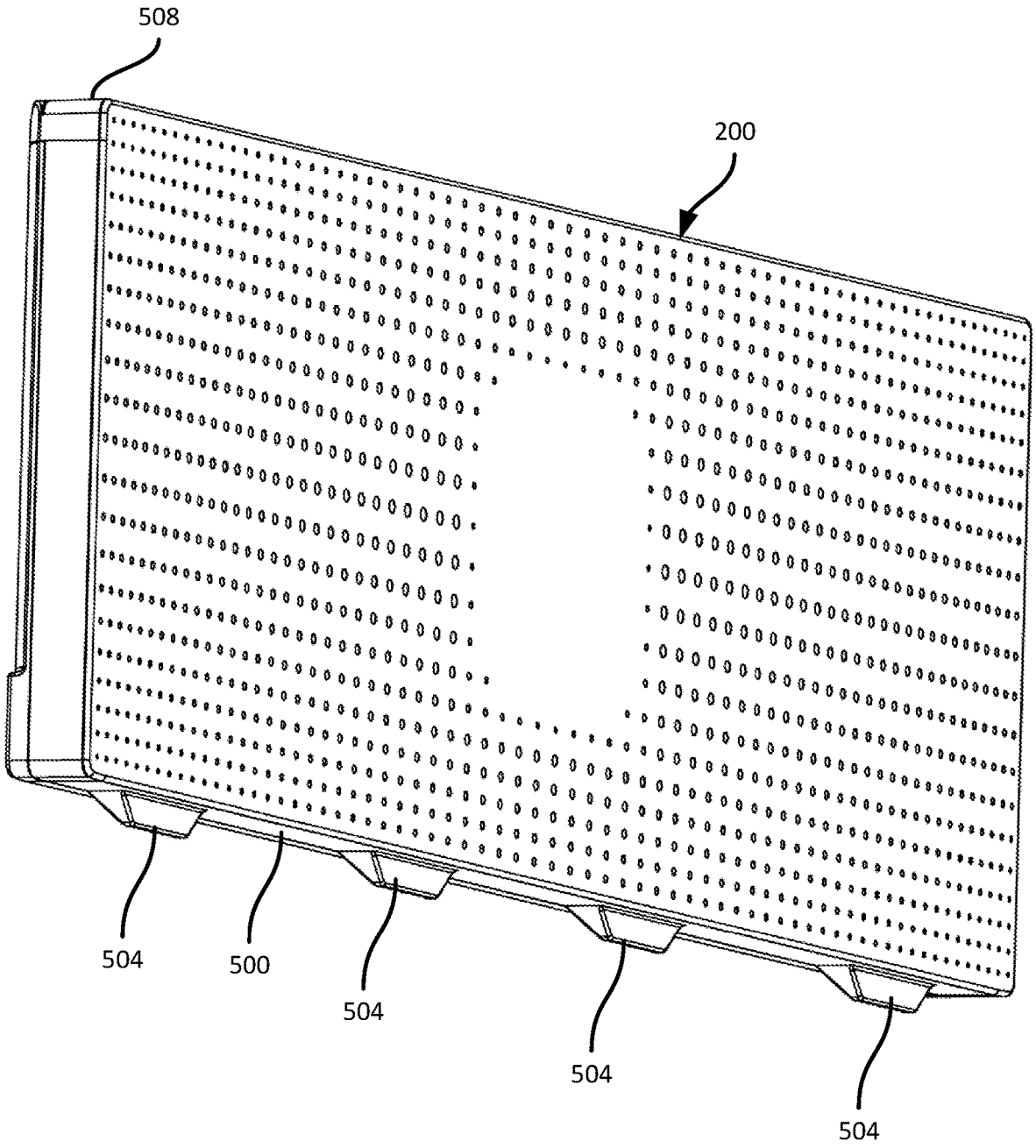


FIG. 5

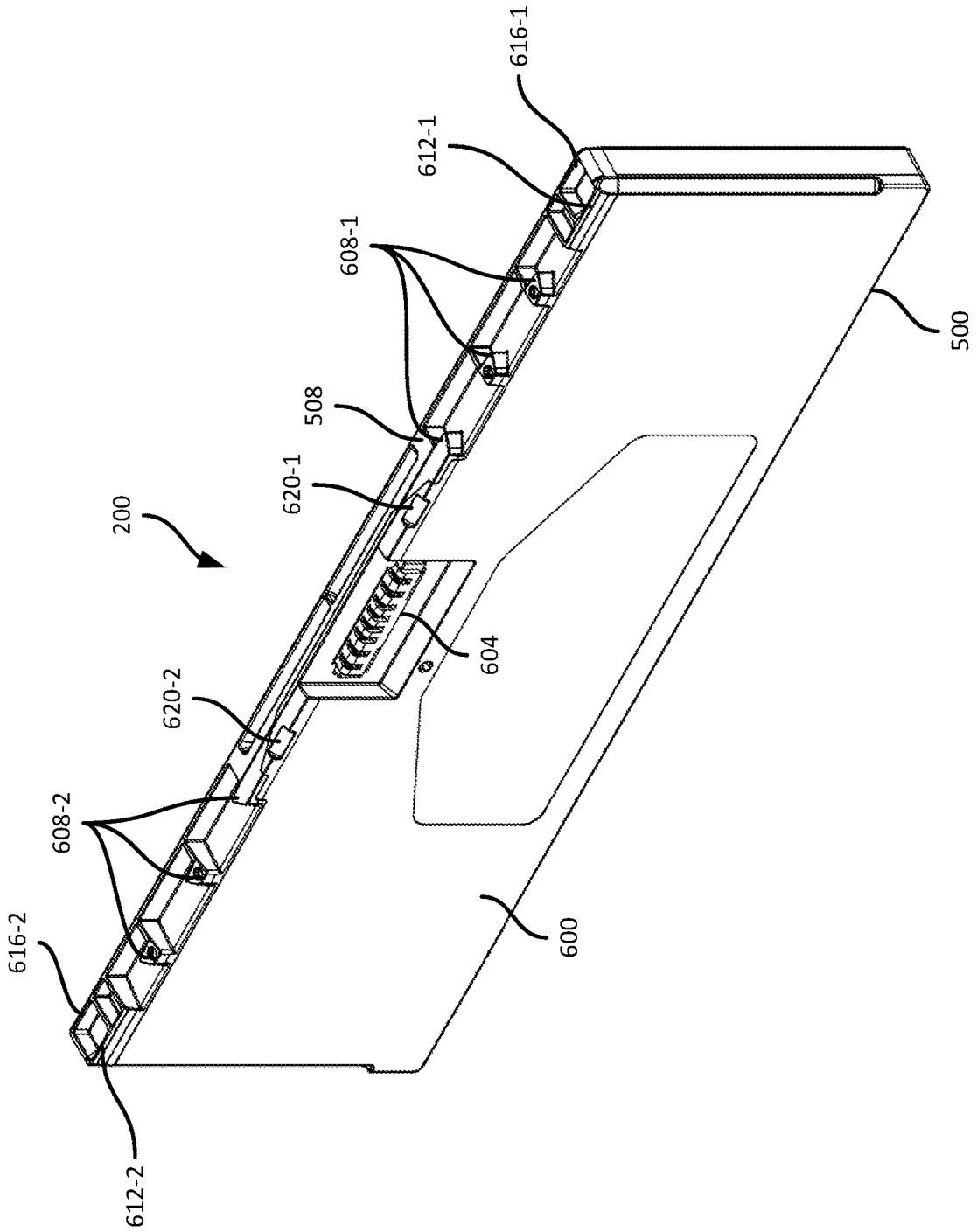
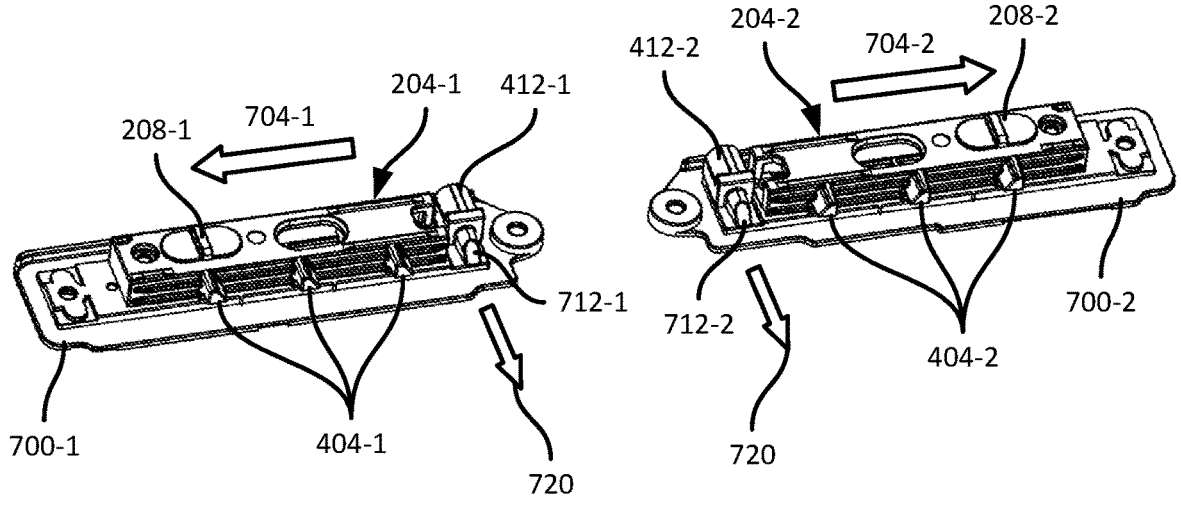


FIG. 6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704-1
204-1
412-1
712-1
700-1
404-1
720
412-2
204-2
704-2
208-2
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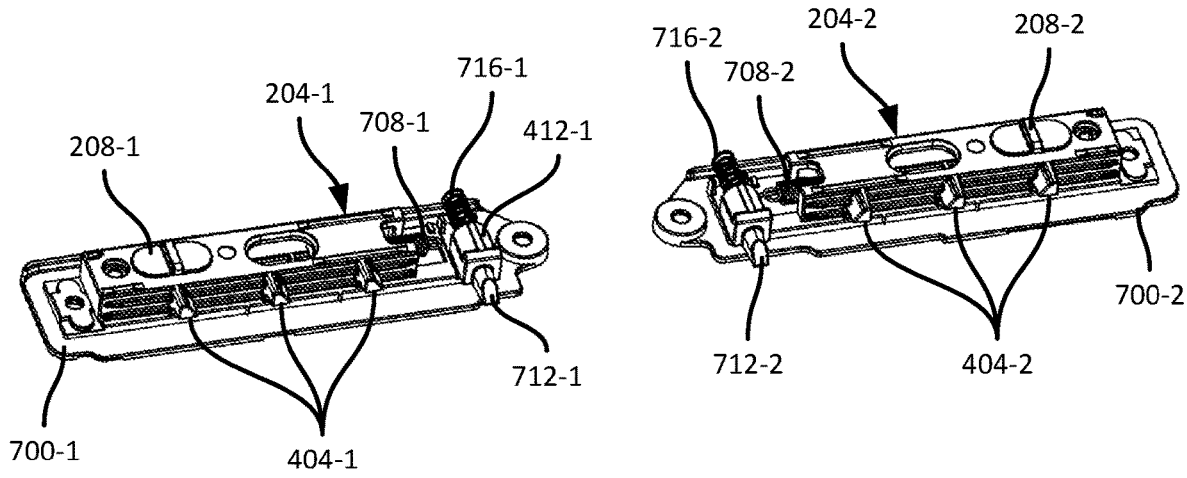
700-2
404-2
720

FIG. 7A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712-1
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404-1
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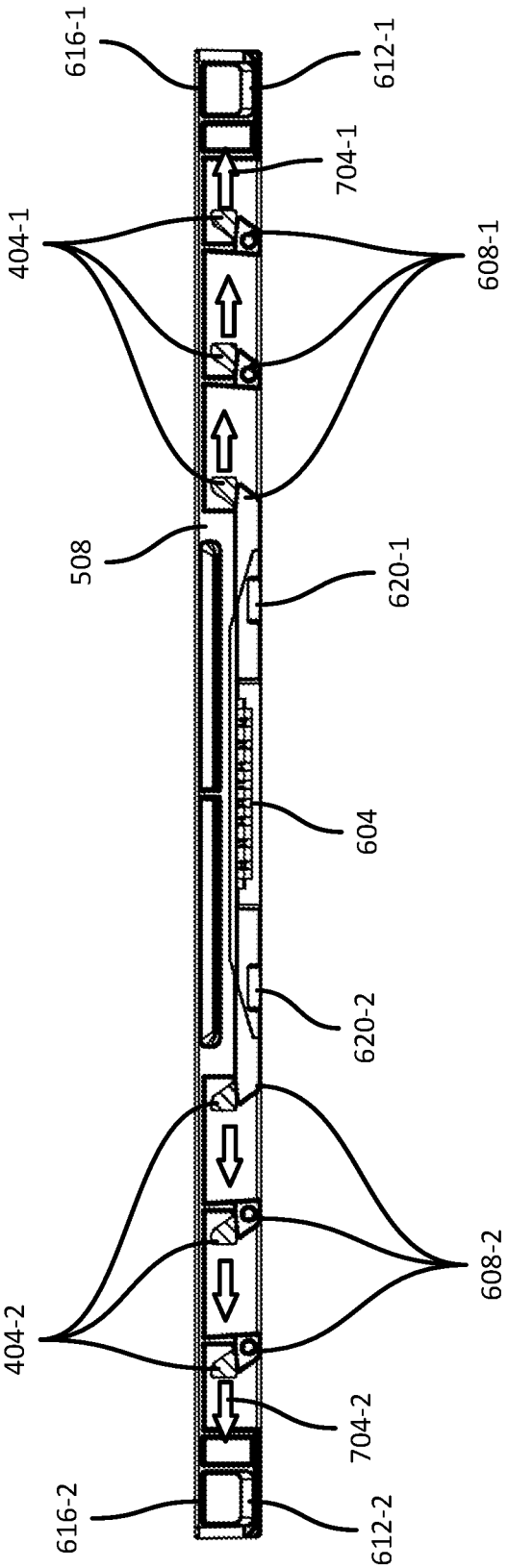
712-2
404-2

FIG. 7B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612-1
704-1
404-1
608-1
508
620-1
604
620-2
608-2
404-2
704-2
616-2
612-2

FIG. 8

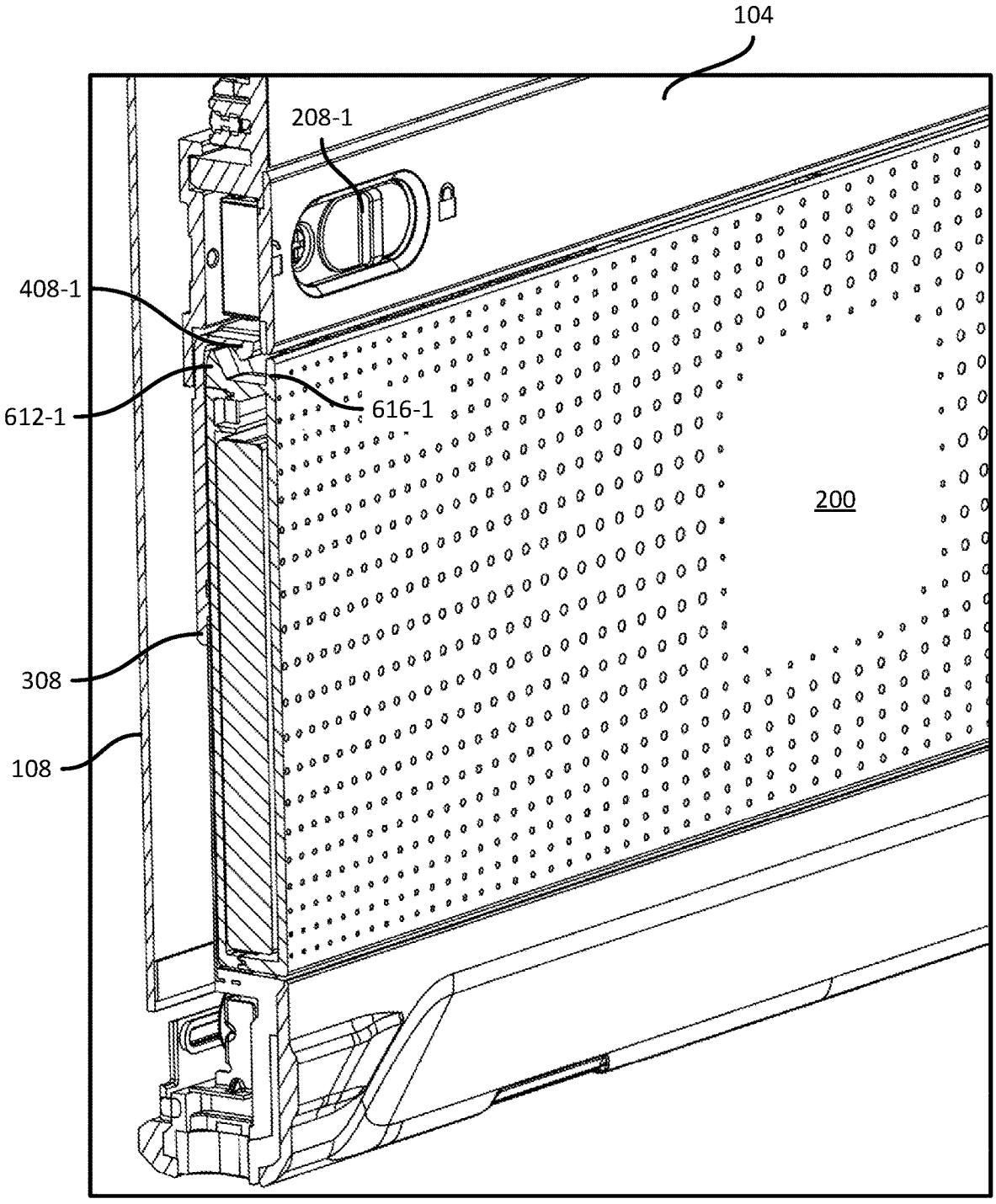

FIG. 9

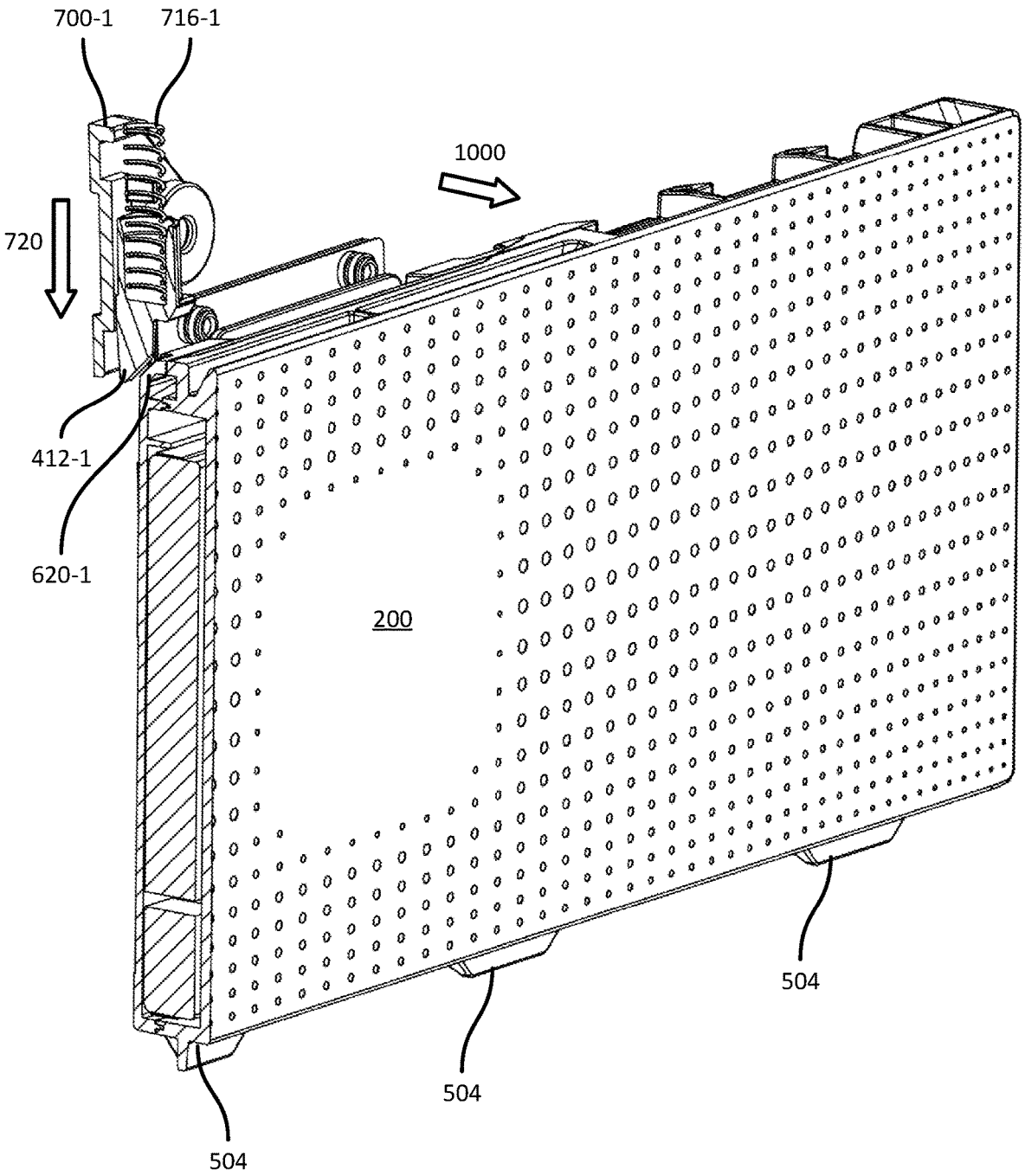

FIG. 10

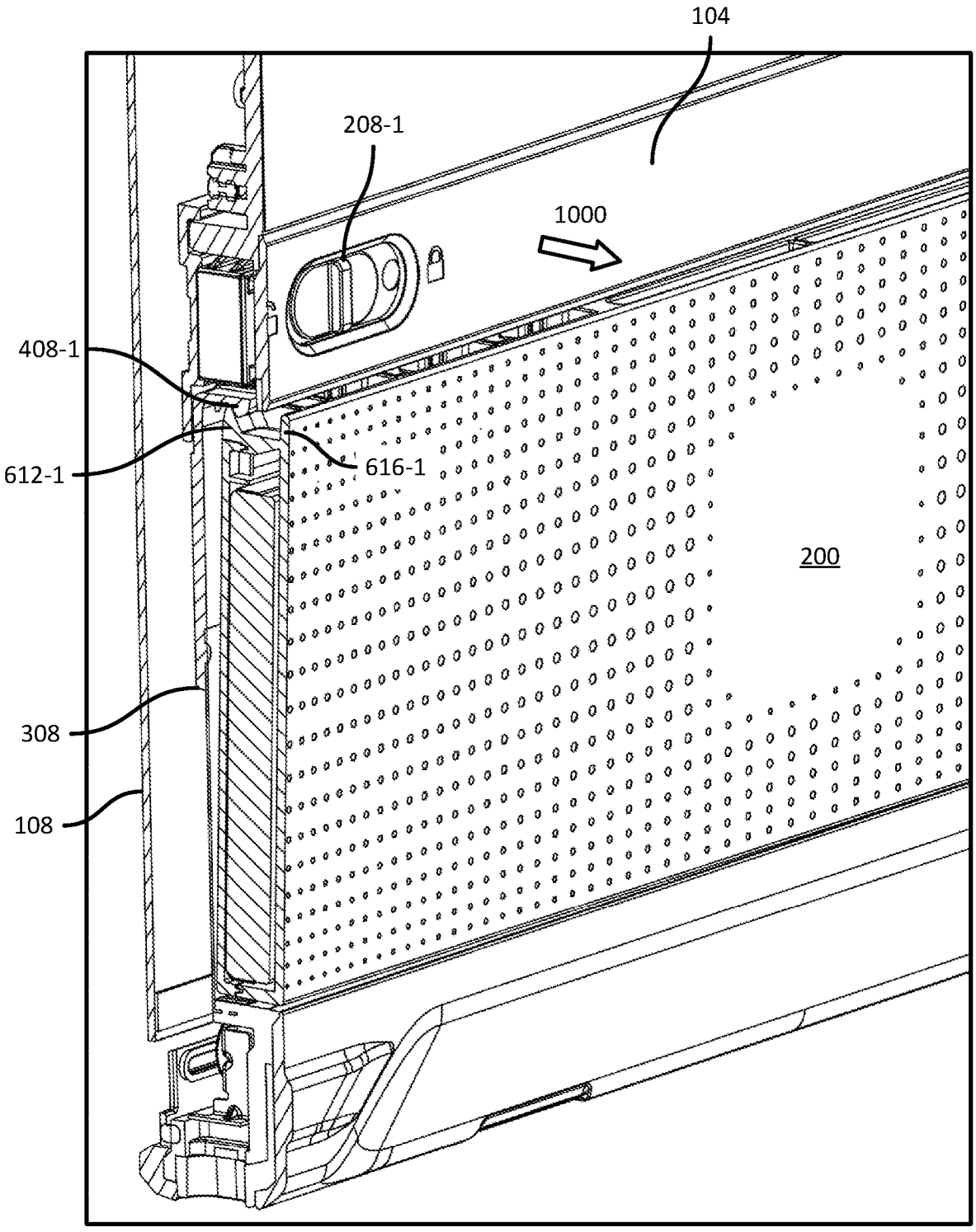

FIG. 11

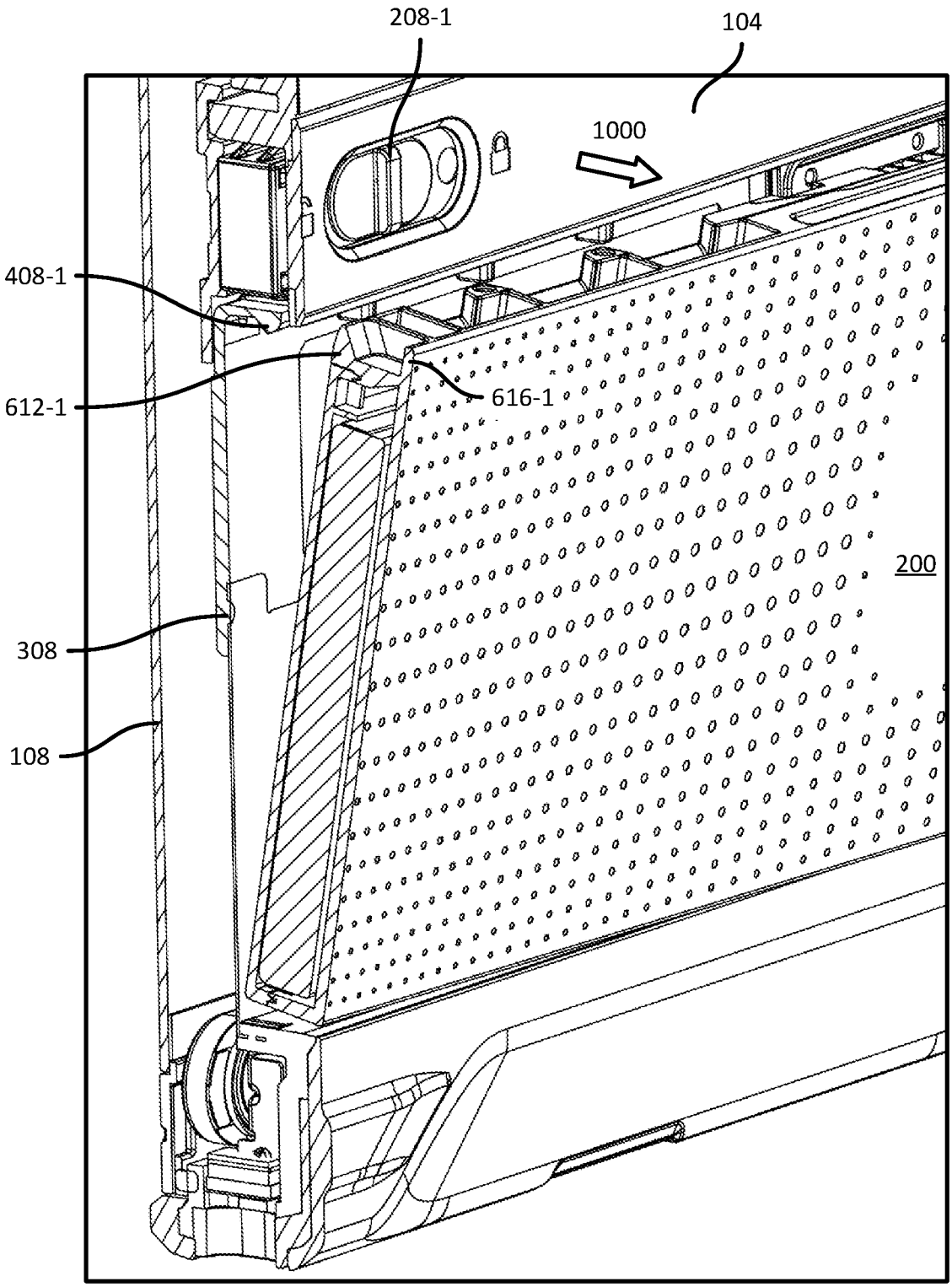

FIG. 12

BATTERY PACK RETENTION SYSTEMS FOR MOBILE COMPUTING DEVICES

BACKGROUND

Certain computing devices, such as tablet computers, can be provided with battery packs that are removable by operators of the devices, e.g., to recharge or replace a depleted battery. Such a computing device may be provided with a fastening mechanism for coupling the battery pack to the computing device. Disabling the fastening mechanism, e.g., by an operator of the computing device to replace the battery, may lead to the battery pack falling from the computing device, which may in turn result in damage to the battery pack.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

The accompanying figures, where like reference numerals refer to identical or functionally similar elements throughout the separate views, together with the detailed description below, are incorporated in and form part of the specification, and serve to further illustrate embodiments of concepts that include the claimed invention, and explain various principles and advantages of those embodiments.

FIG. **1** is a front perspective view of a mobile computing device.

FIG. **2** is a rear perspective view of the mobile computing device of FIG. **1**, with a battery pack installed.

FIG. **3** is a rear perspective view of the mobile computing device of FIG. **2**, with the battery pack removed.

FIG. **4** is another rear perspective view of the mobile computing device of FIG. **2**, with the battery pack removed.

FIG. **5** is an outer perspective view of the battery pack of FIG. **2**.

FIG. **6** is an inner perspective view of the battery pack of FIG. **2**.

FIG. **7**A is a diagram of a latching assembly of the mobile computing device of FIG. **2** in isolation, in a latched position.

FIG. **7**B is a diagram of a latching assembly of the mobile computing device of FIG. **2** in isolation, in an unlatched position.

FIG. **8** is a top view of the battery of FIG. **6**, with a cross-sectional view of latching posts of the latch assembly shown in FIGS. **7**A and **7**B.

FIG. **9** is a partial cross section of the mobile computing device of FIG. **1**, with the battery pack in an installed position.

FIG. **10** is a cross section of the battery of FIG. **5** and a lifting element of the latching assemblies shown in FIGS. **7**A and **7**B.

FIG. **11** is a partial cross section of the mobile computing device of FIG. **1**, with the battery pack in an intermediate position following unlatching of the latches.

FIG. **12** is a partial cross section of the mobile computing device of FIG. **1**, with the battery pack being removed from the device.

Skilled artisans will appreciate that elements in the figures are illustrated for simplicity and clarity and have not necessarily been drawn to scale. For example, the dimensions of some of the elements in the figures may be exaggerated relative to other elements to help to improve understanding of embodiments of the present invention.

The apparatus and method components have been represented where appropriate by conventional symbols in the drawings, showing only those specific details that are pertinent to understanding the embodiments of the present invention so as not to obscure the disclosure with details that will be readily apparent to those of ordinary skill in the art having the benefit of the description herein.

DETAILED DESCRIPTION

Examples disclosed herein are directed to a computing device, comprising: a housing defining a battery chamber; an electrical contact disposed on a wall of the battery chamber; a latch extending into the battery chamber, the latch movable between (i) a first position to retain a battery pack within the battery chamber and engage the battery pack with the electrical contact, and (ii) a second position to disengage from the battery pack; an auxiliary retainer in communication with the battery chamber, the auxiliary retainer configured to retain the battery pack within the battery chamber, independently of the latch, via engagement with a complementary retaining structure of the battery pack.

Additional examples disclosed herein are directed to a system, comprising: a battery pack including: a body containing one or more battery cells; a hook extending from the body; and a retaining wall extending from the body; and a computing device including: a housing defining a battery chamber configured to removably receive the battery pack; a latch extending into the battery chamber, the latch movable between (i) a first position to engage with the hook to retain the battery pack within the battery chamber and engage the battery pack with the electrical contact, and (ii) a second position to disengage from the battery pack; and an auxiliary retainer in communication with the battery chamber, the auxiliary retainer configured to engage with the retaining wall to retain the battery pack within the battery chamber, independently of the latch, via engagement with a complementary retaining structure of the battery pack.

FIG. **1** illustrates a mobile computing device **100** (also referred to herein as the device **100**), such as a tablet computer. In other examples, the computing device **100** can be implemented in other form factors, including as a smartphone, a wrist-mounted mobile computer, a laptop computer, or the like. The device **100** includes a housing **104** supporting various other components of the device **100**, such as a display **108** disposed on a front of the device **100** (e.g., a side of the device **100** configured to face an operator of the device **100**). The housing **104** can also support various other components, including function buttons **112**, and the like, as well as various internal components of the device **100**.

Some components of the device **100**, including for example a computing subsystem (e.g., including one or more processors, memory circuits, and the like) are electrically powered. Turning to FIG. **2**, which illustrates a back of the device **100** (e.g., opposite the display **108**), the device **100** can carry a battery pack **200** (also referred to herein as the battery **200**), including a body housing one or more rechargeable cells. The battery **200** is removably supported by the housing **104**, to facilitate replacement of the battery **200** with another battery, e.g., to recharge the battery **200**. The device **100** includes, among other battery retention components, at least one latch. In the present example, the device **100** includes latches **204-1** and **204-2** (collectively referred to as the latches **204**, and generically referred to as a latch **204**; similar nomenclature is also used elsewhere herein for components of which the device **100** includes multiple instances).

The latches **204** are movable between first (e.g., latched) and second (e.g., unlatched) positions. In the first position, shown in FIG. **2**, in which the latches **204** retain the battery **200** in an engaged position relative to the device **100**, to supply the device **100** with electrical power. The latches **204** may be moved to the second position via manipulation of actuators **208-1** and **208-2** (e.g., sliders exposed at a rear wall of the device **100**). In the second position, the latches **204** disengage with the battery **200**, facilitating removal of the battery **200** from the device **100**.

In some computing devices, unlatching a battery pack may lead to accidental dropping of the battery pack, as the battery pack is no longer secured to the computing device. Dropping the battery pack may lead to damage and/or loss of the battery pack. As discussed below, the device **100** and the battery **200** include various structural features to mitigate the risk of dropping the battery **200** when the battery **200** is disengaged from the device **100**.

Referring to FIG. **3**, the device **100** is shown from the back, with the battery **200** removed to reveal a battery compartment or battery chamber **300**, defined by the housing **104**. The chamber **300** extends into the housing **104**, such that an outer wall of the battery **200** lies substantially flush with the back of the device **100** when the battery **200** is coupled with the device **100** (as shown in FIG. **2**). The chamber **300** includes an electrical contact or set of electrical contacts **304**, e.g., disposed on an inner wall **308** of the chamber **300**, substantially parallel with the display **108**. The contacts **304** can be disposed on other surfaces within the chamber **300**, in other examples. The chamber **300** also includes, e.g., on a lower wall **312**, one or more recesses **316**. In the present example, the chamber **300** includes four recesses **316**, each configured to receive a corresponding protrusion of the battery **200**, discussed further below.

As also shown in FIG. **3**, the chamber **300** can include a storage device compartment **320**, e.g., accessible when the battery **200** has been removed. The compartment **320** can contain one or more removable storage devices, such as flash memory cards (e.g., SD cards), or the like.

Turning to FIG. **4**, an upper wall **400** of the chamber **300** is visible, opposite the lower wall **312**. The upper wall **400** includes openings therein through which posts **404-1** and **404-2** of the latches **204-1** and **204-2**, respectively, extend into the chamber **300**. The posts **404** are therefore, in this example, disposed on an opposite wall of the chamber **300** from the recesses **316**. Together, the recesses **316** and the posts **404** engage with opposing walls of the battery **200** to retain the battery **200** within the chamber **300**. In the present example, the latch **204-1** includes three posts **404-1** mechanically coupled with the actuator **208-1**, and the latch **204-2** includes three posts **404-2** mechanically coupled with the actuator **208-2**. Smaller or greater numbers of posts **404** can be implemented in other examples. In response to manipulation of the actuators **208**, the posts **404** move between the first, or latched, position as shown in FIG. **4**, and the second, or unlatched, position.

The chamber **300** also contains auxiliary retainers **408-1**, and **408-2**, e.g., disposed adjacent to opposing sides of the chamber **300** (the sides being walls of the chamber **300** extending between the upper wall **400** and the lower wall **312**). In other examples, the auxiliary retainers **408** can be disposed further from the sides of the chamber **300**. Further, while the auxiliary retainers **408** are on the upper wall **400**, thus sharing the upper wall **400** with the latches **204**, in other examples the auxiliary retainers **408** can be disposed on a different wall of the chamber **300**.

The auxiliary retainers **408**, as discussed below, are configured to engage with certain structures of the battery **200**, to couple the battery **200** with the device **100** even when the latches **204** are unlatched. More specifically, the auxiliary retainers **408** permit the battery **200** to be partially disengaged from the device **100**, e.g., by unlatching the latches **204** and permitting the battery **200** to disengage with the contacts **304** (thus ceasing to deliver power to the device **100**), while preventing the battery **200** from falling out of the chamber **300** entirely, regardless of the current orientation of the device **100**. That is, if the device **100** is held with the display **108** facing substantially upwards, and the latches **204** are unlatched, the auxiliary retainers **408** serve to prevent the battery **200** from falling out of the chamber **300** under the action of gravity.

The device **100** can also include lifting elements **412-1** and **412-2**, configured to extend into the chamber **300**. The lifting elements **412** are movable between an extended, or lifting, position as shown in FIG. **4**, and a retracted, or idle, position. In the lifting position, the lifting elements **412** are configured to engage with the battery **200** to push the battery **200** partially out of the chamber (with the auxiliary retainers **408** preventing the battery **200** from falling from the chamber **300**). The lifting elements **412** can, in other words, partially disengage the battery **200** from the device **100** to assist in the removal of the battery **200**. When the battery **200** is installed and the latches **204** are in the latched position, the lifting elements **412** are pushed into the retracted, or idle, position, where they remain until the latches **204** are unlatched.

Turning to FIG. **5**, the battery **200** is shown in isolation, from a back or outer side (e.g., the face of the battery **200** that remains exposed when the battery **200** is installed in the chamber **300**). The battery **200** includes, on a lower wall **500** thereof, at least one protrusion **504**, such as a wedge-shaped fin or blade. In the present example, the battery **200** includes four protrusions **504**, each corresponding to one of the recesses **316** in the lower wall **312** of the chamber **300**. Installation of the battery **200** in the chamber **300** can begin, for example, by placing the protrusions **504** in the recesses **316** before rotating an upper wall **508** of the battery **200** into the chamber **300** about an axis adjacent to the lower wall **500**.

FIG. **6** illustrates a front or inside of the battery **200** (e.g., the face of the battery that faces into the chamber **300** when the battery **200** is installed). The battery **200** includes, on an inside wall **600**, one or more battery contacts **604** configured to engage with the contacts **304** within the chamber **300**, to deliver power from the battery **200** to the device **100**. The battery **200** also includes, e.g., on the upper wall **508**, one or more hooks **608-1**, and one or more hooks **608-2**, corresponding to the posts **404-1** and **404-2**. In the present example, therefore, the battery **200** includes three hooks **608-1**, and three hooks **608-2**. The hooks **608** are configured to engage with the posts **404** when the latches **204** are in the latched position, to retain the battery **200** within the chamber **300** (e.g., with the contacts **304** and **604** engaged).

The battery **200** also includes retaining walls **612-1** and **612-2**, configured to engage with the auxiliary retainers **408-1** and **408-2**, respectively, to mitigate dropping of the battery **200** when the posts **404** are not engaged with the hooks **608**. In the illustrated example, the retaining walls **612** are disposed adjacent to opposing sides of the battery **200**, corresponding with the positions of the auxiliary retainers **408**. In other examples, the retaining walls **612** can be

disposed on the upper wall **508** in other positions, e.g., to match the positions of the auxiliary retainers **408** within the chamber **300**.

The battery **200** also includes ledges **616-1** and **616-2** in line with the back of the battery **200** (whereas the retaining walls **612** are in line with the wall **600** of the battery **200**). The ledges **616** can be disposed, as shown in FIG. **6**, adjacent to opposing sides of the battery **200**, but can also be placed at other locations on the upper wall **508**. The ledges **616**, as discussed below, facilitate grasping of the battery **200** (e.g., by an operator of the device **100**) to fully remove the battery **200** from the chamber **300**, overcoming resistance provided by the engagement between the auxiliary retainers **408** and the retaining walls **612**.

Also shown in FIG. **6** are inclined strike surfaces **620-1** and **620-2**, defined on the upper wall **508** of the battery **200**. As discussed below, the strike surfaces **620** are configured to engage with the lifting elements **412** of the device **100**.

Referring to FIGS. **7**A and **7**B, the latches **204** and lifting elements **412** are shown isolated from the remainder of the device **100**. The latches **204** can be mounted within the housing **104**, for example on respective latch covers **700-1** and **700-2** that are in turn affixed to interior surfaces of the housing **104**. The latches **204** are slidably mounted on the covers **700**, such that each latch **204** can slide between a first, latched, position as shown in FIG. **7**A, and a second, unlatched, position as shown in FIG. **7**B. In the present example, the latches **204** slide in opposing directions **704-1** and **704-2**. As noted earlier, movement of the latches **204** (in the corresponding directions **704**) can be effected by application of forces to the actuators **208-1** and **208-2**. Each latch **204** can be biased towards the first position (that is, the latched position), e.g., by a bias element such as a spring **708-1**, **708-2** coupled between the corresponding latch **204** and the cover **700** or other structure within the housing **104**.

FIGS. **7**A and **7**B also illustrate the lifting elements **412** in a first, idle, position (FIG. **7**A), and a second, lifting, position (FIG. **7**B). The lifting elements **412** extend into the chamber **300**, e.g., in a direction substantially parallel to the inner wall **308** of the chamber **300**. In other examples, the lifting elements **412** can be disposed within the inner wall **308** itself, and extend into the chamber **300** in a direction substantially perpendicular to the inner wall **308**.

As seen in FIG. **7**A, in the idle position, the lifting elements **412** are withdrawn or retracted from the chamber **300**. In the lifting position shown in FIG. **7**B, however, the lifting elements **412** extend into the chamber **300**. Each lifting element includes a wedge-shaped head **712-1**, **712-2** with an angle complementary to that of the corresponding strike surface **620** of the battery **200**. As will now be apparent, when the lifting elements **412** extend into the chamber in the lifting position (i.e., moving in a direction **720**), the wedge-shaped heads **712** engage with the strike surfaces **620** of the battery **200**, and lift the battery **200** away from the inner wall **308** of the chamber **300**. This lifting action is permitted when the latches **204** are in the unlatched position.

When the latches **204** are in the latched position and the battery **200** is installed in the chamber **300**, the latches **204** prevent the battery **200** from being lifted away from the inner wall **308**, and the lifting elements **412** are retained in the idle position of FIG. **7**A by the battery **200**. The lifting elements **412** can be biased towards the extended, lifting position of FIG. **7**B by respective bias elements **716-1**, **716-2**, such as springs.

FIG. **8** illustrates a top view of the battery **200** with a cross section of the posts **404**, illustrating that when the posts **404** are in the first, latched, position, the hooks **608** of the battery **200** are compressed between the inner wall **308** of the chamber **300** and the posts **404**. The battery **200** is therefore retained inside the chamber **300**, with the battery contacts **604** engaged with the contacts **304** of the device **100**. When the posts **404-1** and **404-2** are moved in the directions **704-1** and **704-2**, respectively, the posts **404** are taken out of engagement with the hooks **608** (as the battery **200** includes empty spaces alongside each hook **608**, as also shown in FIG. **6**), permitting the battery **200** to move away from the inner wall **308**.

Turning to FIG. **9**, interactions between the various components noted above is discussed. FIG. **9** illustrates a partial cross section of the device **100** and battery **200**, taken at the plane S**9** labelled in FIG. **2**. When the battery **200** is fully inserted in the chamber **300** and the latches **204** are in the latched position, as shown in FIG. **9**, the battery **200** is held against the inner wall **308** of the chamber **300**, and the outer wall of the battery **200** is substantially flush with a surrounding portion of the housing **104**.

FIG. **10** illustrates a cross section of the battery **200**, along with the lifting element **412-1**, following release of the latches **204** (that is, movement of the latches **204** to the unlatched position). When the latches **204** are released, the battery **200** is permitted to move within the chamber **300** (to a degree limited by the auxiliary retainers **408**), and therefore no longer restricts the movement of the lifting elements **412**. The lifting element **412-1** therefore, under the action of the bias element **716-1**, extends in the direction **720** into the chamber **300**, and engages with the strike surface **620-1** of the battery **200**. As a result, the lifting element **412-1** (along with the lifting element **412-2**, which makes a similar motion) lifts the battery **200** away from the inner wall **308** of the chamber **300**, e.g., pivoting the battery **200** in a direction **1000** about an axis defined by the protrusions **504** (which remain engaged with the recesses **316**).

FIG. **11** illustrates a cross section at the plane S**9**, following release of the latches **204**. Under the action of the lifting elements **412** (and/or, in some cases, gravity, e.g., if the device **100** is tilted such that the battery **200** faces downwards), the battery **200** pivots away from the inner wall **308** of the chamber **300**. The battery **200** is prevented from falling out of the chamber **300**, however, by the auxiliary retainers **408** and the retaining walls **612**. As shown in FIG. **11**, the retaining walls **612** engage with the auxiliary retainers **408** to retain the battery **200** in an intermediate position. In the intermediate position shown, the battery **200** is not fully engaged with the device **100**. For example, the contacts **304** and **604** may be disengaged, such that the battery **200** no longer delivers power to the device **100**.

To remove the battery **200** from the chamber **300**, the ledges **616** can be grasped, e.g., by an operator of the device **100**, and pulled in the direction **1000**. Either or both of the auxiliary retainers **408** and the retaining walls **612** are resiliently deformable (e.g., being made of rubber or other suitable resilient material), and pulling on the battery **200** (e.g., via the ledges **616**) therefore deforms the auxiliary retainers **408**, the retaining walls **612**, or both, breaking the engagement between the auxiliary retainers **408** and the retaining walls **612**, and permitting withdrawal of the battery **200** from the chamber **300**, as shown in FIG. **12**. As will be apparent from the above discussion, installation of a battery is performed by placing the protrusions **504** in the recesses **316**, and then rotating the battery **200** into the chamber **300**. Applying pressure deforms the auxiliary retainers **408** and/or retaining walls **612** to fully insert the battery **200** into the chamber **300**, pushing the lifting elements **412** into the

retracted, or idle, position. The latches **204** are shifted to the unlatched position upon contact with the battery **200**, and return to the latched position when the battery **200** is fully inserted.

In the foregoing specification, specific embodiments have been described. However, one of ordinary skill in the art appreciates that various modifications and changes can be made without departing from the scope of the invention as set forth in the claims below. Accordingly, the specification and figures are to be regarded in an illustrative rather than a restrictive sense, and all such modifications are intended to be included within the scope of present teachings.

The benefits, advantages, solutions to problems, and any element(s) that may cause any benefit, advantage, or solution to occur or become more pronounced are not to be construed as a critical, required, or essential features or elements of any or all the claims. The invention is defined solely by the appended claims including any amendments made during the pendency of this application and all equivalents of those claims as issued.

Moreover in this document, relational terms such as first and second, top and bottom, and the like may be used solely to distinguish one entity or action from another entity or action without necessarily requiring or implying any actual such relationship or order between such entities or actions. The terms "comprises," "comprising," "has", "having," "includes", "including," "contains", "containing" or any other variation thereof, are intended to cover a non-exclusive inclusion, such that a process, method, article, or apparatus that comprises, has, includes, contains a list of elements does not include only those elements but may include other elements not expressly listed or inherent to such process, method, article, or apparatus. An element proceeded by "comprises . . . a", "has . . . a", "includes . . . a", "contains . . . a" does not, without more constraints, preclude the existence of additional identical elements in the process, method, article, or apparatus that comprises, has, includes, contains the element. The terms "a" and "an" are defined as one or more unless explicitly stated otherwise herein. The terms "substantially", "essentially", "approximately", "about" or any other version thereof, are defined as being close to as understood by one of ordinary skill in the art, and in one non-limiting embodiment the term is defined to be within 10%, in another embodiment within 5%, in another embodiment within 1% and in another embodiment within 0.5%. The term "coupled" as used herein is defined as connected, although not necessarily directly and not necessarily mechanically. A device or structure that is "configured" in a certain way is configured in at least that way, but may also be configured in ways that are not listed.

Certain expressions may be employed herein to list combinations of elements. Examples of such expressions include: "at least one of A, B, and C"; "one or more of A, B, and C"; "at least one of A, B, or C"; "one or more of A, B, or C". Unless expressly indicated otherwise, the above expressions encompass any combination of A and/or B and/or C.

It will be appreciated that some embodiments may be comprised of one or more specialized processors (or "processing devices") such as microprocessors, digital signal processors, customized processors and field programmable gate arrays (FPGAs) and unique stored program instructions (including both software and firmware) that control the one or more processors to implement, in conjunction with certain non-processor circuits, some, most, or all of the functions of the method and/or apparatus described herein. Alternatively, some or all functions could be implemented by a state machine that has no stored program instructions, or in one or more application specific integrated circuits (ASICs), in which each function or some combinations of certain of the functions are implemented as custom logic. Of course, a combination of the two approaches could be used.

Moreover, an embodiment can be implemented as a computer-readable storage medium having computer readable code stored thereon for programming a computer (e.g., comprising a processor) to perform a method as described and claimed herein. Examples of such computer-readable storage mediums include, but are not limited to, a hard disk, a CD-ROM, an optical storage device, a magnetic storage device, a ROM (Read Only Memory), a PROM (Programmable Read Only Memory), an EPROM (Erasable Programmable Read Only Memory), an EEPROM (Electrically Erasable Programmable Read Only Memory) and a Flash memory. Further, it is expected that one of ordinary skill, notwithstanding possibly significant effort and many design choices motivated by, for example, available time, current technology, and economic considerations, when guided by the concepts and principles disclosed herein will be readily capable of generating such software instructions and programs and ICs with minimal experimentation.

The Abstract of the Disclosure is provided to allow the reader to quickly ascertain the nature of the technical disclosure. It is submitted with the understanding that it will not be used to interpret or limit the scope or meaning of the claims. In addition, in the foregoing Detailed Description, it can be seen that various features are grouped together in various embodiments for the purpose of streamlining the disclosure. This method of disclosure is not to be interpreted as reflecting an intention that the claimed embodiments require more features than are expressly recited in each claim. Rather, as the following claims reflect, inventive subject matter lies in less than all features of a single disclosed embodiment. Thus the following claims are hereby incorporated into the Detailed Description, with each claim standing on its own as a separately claimed subject matter.

The invention claimed is:

1. A computing device, comprising:

a housing defining a battery chamber;

an electrical contact disposed on a wall of the battery chamber;

a latch extending into the battery chamber, the latch movable between (i) a first position to retain a battery pack within the battery chamber and engage the battery pack with the electrical contact, and (ii) a second position to permit removal of the battery pack from the chamber;

an auxiliary retainer in communication with the battery chamber, the auxiliary retainer configured to retain the battery pack within the battery chamber, independently of the latch, via engagement with a complementary retaining structure of the battery pack.

2. The computing device of claim **1**, wherein the latch is biased to the first position.

3. The computing device of claim **2**, further comprising:

a bias member coupled between the latch and an internal body of the computing device to bias the latch to the first position.

4. The computing device of claim **1**, wherein the latch extends into the battery chamber from a side wall of the battery chamber; and

wherein the computing device includes a latch actuator disposed on a rear wall of the housing adjacent to the battery chamber.

5. The computing device of claim 4, wherein the housing defines a recess in a side wall of the battery chamber opposite the latch, configured to receive a protrusion of the battery pack.

6. The computing device of claim 4, wherein the latch actuator is affixed to the latch.

7. The computing device of claim 1, wherein the auxiliary retainer includes a resiliently deformable hook extending from a side wall of the battery chamber into the battery chamber to engage with the complementary retaining structure, the auxiliary retainer being deformable to permit passage of the complementary retaining structure.

8. The computing device of claim 1, further comprising:

a lifting member movable between a lifting position extending into the battery chamber, and an idle position retracted from the battery chamber;

wherein the lifting member is configured to lift the battery pack outwards from the battery chamber when the latch is in the second position.

9. The computing device of claim 8, wherein the lifting member extends into the battery chamber from a side wall of the battery chamber, the lifting member including a wedge-shaped head configured to engage with an inclined strike surface of the battery pack.

10. The computing device of claim 8, further comprising a bias member configured to bias the lifting member to the lifting position.

11. The computing device of claim 1, wherein the auxiliary retainer is disposed adjacent to a first side of the battery chamber; the computing device further comprising a further auxiliary retainer disposed adjacent to a second side of the battery chamber opposite the first side.

12. A system, comprising:

a battery pack including:

a body containing one or more battery cells;

a hook extending from the body; and

a retaining wall extending from the body; and

a computing device including:

a housing defining a battery chamber configured to removably receive the battery pack;

a latch extending into the battery chamber, the latch movable between (i) a first position to engage with the hook to retain the battery pack within the battery chamber and engage the battery pack with the electrical contact, and (ii) a second position to disengage from the battery pack; and

an auxiliary retainer in communication with the battery chamber, the auxiliary retainer configured to engage with the retaining wall to retain the battery pack within the battery chamber, independently of the latch, via engagement with a complementary retaining structure of the battery pack.

13. The system of claim 12, wherein the computing device housing includes a recess in a lower wall of the battery chamber; and

wherein the battery pack includes a protrusion receivable in the recess.

14. The system of claim 12, wherein the battery includes a ledge extending from the body.

15. The system of claim 14, wherein the ledge is adjacent to the retaining wall.

16. The system of claim 12, wherein at least one of the auxiliary retainer and the retaining wall is resiliently deformable.

17. The system of claim 12, wherein the computing device further comprises a lifting member movable between a lifting position extending into the battery chamber, and an idle position retracted from the battery chamber.

18. The system of claim 17, wherein the battery further comprises a strike surface configured to engage with the lifting member.

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